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Molasses in Ration for Fattening Calves

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MOLASSES IN RATION FOR FATTENING CALVES

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In response to numerous questions raised by cattle feeders, the Animal Industry Department of the Ohio Experiment Station has conducted a test in which feeding molasses, both cane and beet, were used as a part of the ration. Many of the problems relative to the feeding of molasses were untouched in the test.

All lots received the same amount of protein supplement, corn silage, and mixed clover and timothy hay. The protein supplement consisted of equal parts of linseed meal and cottonseed meal, each being fed at the rate of one pound daily per calf. Six and one-half pounds of corn silage and one and one-half pounds of mixed hay were fed daily per calf, regardless of lot, throughout the test.

Lot 1, in addition, was fed all the shelled corn they desired.

There seems to be some difference of opinion relative to the ability of feeding molasses to replace corn. With this in mind two pounds of the shelled corn in the ration for each calf of Lot 2 were replaced by two pounds of cane molasses; that is, when the calves in Lot 1 received six pounds of shelled corn per calf, the calves in Lot 2 received four pounds of shelled corn and two pounds of molasses.

Lot 3 was fed two pounds of cane molasses per calf and all the shelled corn they wanted.

Lot 4 was self-fed molasses from a feed bunk placed in the lot, molasses being constantly available. These calves were also given all the shelled corn they wanted.

Lot 5 was fed beet molasses. Their ration was the same as that of Lot 3, excepting that beet molasses replaced cane molasses.

One hundred steer calves, purchased from Terrett Bros., Rosebud, Montana, were used in the test. The calves were dehorned about two weeks prior to time of shipment. They arrived in Wooster November 14 in good condition and remained healthy. They were of uniform quality but varied considerably in size. The heaviest calf at time of allotment weighed 490 pounds and the lightest calf, 270 pounds. To counteract this variation in individual weights the calves were so allotted in pens as to result in an equitable distribution of various sized calves. In order to obtain

the initial weights for the test the calves were weighed December 9, 10, and 11; the average of these three weights was taken as the starting weight, as of December 10.

Feeds used were: cottonseed meal carrying 41% protein and linseed meal, 34% protein; corn silage made from corn well dented when put into the silo; hay of excellent quality; and shelled corn and molasses which were purchased. Samples were obtained of the various shipments of shelled corn, and the moisture content determined. The corn was then calculated to a moisture content of 15.5%. The molasses was obtained from the Wooster Feed Manufacturing Company, which buys in tank car lots from a Philadelphia company. Another large molasses company stated that the molasses used for the test, while not identical with, was representative of their product. Cane molasses was obtained about twice each week. The beet molasses was obtained from the Ohio Sugar Company, at Ottawa, Ohio, in sufficient amount to carry through the test.

The analysis of the molasses was made by C. H. Kick of the Animal Industry department, Ohio Experiment Station, and is shown in Table 1.

TABLE 1.—Analysis of Molasses Used

	Moisture	Ash	Protein	Carbohydrates
	Per cent	*Per cent*	*Per cent*	*Per cent*
Cane molasses	20.32	3.48	1.33	74.87
Beet molasses	15.90	4.44	8.73	70.93

At the end of two weeks of the test, Lots 2, 3, and 5 were being fed two pounds of molasses daily per calf, and, at the end of four weeks, the calves in Lot 4 had molasses available at all times. It was soon noticeable that the calves in Lot 2 were cleaning their troughs more quickly than any other lot. This was true throughout the test. The calves in this pen wanted more feed, but were limited according to the amount eaten by Lot 1.

It is shown in Table 2 that the calves in Lot 2 were so fed that their corn and molasses equalled in weight the amount of corn fed to Lot 1. Lot 3 showed an increased corn consumption throughout the test, as compared with Lot 2. This would indicate that two pounds of molasses did not satisfy the appetite as well as did two pounds of shelled corn. The amount of shelled corn consumed by Lot 3 gradually increased, in proportion to that eaten by Lot 1, until during the latter part of the test they consumed more corn. Their molasses was additional.

Molasses increased feed consumption, but this increase was not due to the molasses being placed on the feeds. In feeding the calves the silage was given first, followed by the corn and the protein supplement; the undiluted molasses was then poured over the feed. Usually half of the grain and more than half of the silage were eaten by the time the molasses was added. The molasses fed to Lot 4 never touched any of the other feeds; yet this lot of calves consumed more corn per calf than any other lot during the last seven weeks of the test. During these seven weeks the calves in Lot 4 also consumed twice as much molasses as any other lot. From this it would seem that molasses stimulated the appetite rather than increased the palatability of the feeds over which it was placed. Another reason why the molasses-fed calves ate more corn during the latter part of the test was because they had grown more, and, therefore, had more capacity to consume feed. More discussion about this point follows.

The feed requirement for one hundred pounds of gain favored molasses as the test progressed. During the last three months of the test the molasses-fed lots of calves made more efficient gains than Lot 1. In our opinion this was due to the fact that the molasses-fed lots were larger and less fat. It requires more feed to put gain on an animal that is nearly finished than on a similar animal that is showing less finish.

The cost of gains is based upon corn at 98 cents a bushel. Molasses was valued at $1.75 per hundred pounds; this is the same price per pound as used for corn. The cane molasses cost that, while the beet molasses cost $22.00 per ton at the plant. The containers and the transportation were furnished by the Experiment Station. Probably, everything considered, the cost of the different kinds of molasses was quite similar. Location has much to do with this. Linseed meal was valued at $58.00, cottonseed meal at $46.00, silage at $6.50, hay at $12.00, and salt at $20.00 per ton.

Table 3 shows the cumulative daily gains by weeks from start to finish. The Lot 2 calves, after the first few weeks, trailed Lot 1, although they were making a better showing during the last half of the test. Lot 3 trailed Lot 1 in gains until the twenty-sixth week of the test. At this time these two lots were even in number of pounds gained during the test. After the twenty-sixth week, Lot 3 forged steadily ahead of Lot 1 in gains, and during the last ten weeks of the test the calves in Lot 3 each made an average gain of 29 pounds more than the calves in Lot 1.

TABLE 2.—Molasses Feeding Test

Feed consumption and feed required for gain—by four-week periods

Ration	1st period December		2nd period January		3rd period February		4th period March		5th period April		6th period May		7th period June		8th period July		9th period August	
	Av. daily ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain
Lot 1	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Shelled corn	5.5	306	7.3	313	9.3	398	10.3	385	10.9	451	11.3	514	11.5	702	11.3	648	10.0	1109
Protein	2.0	111	2.0	85	2.0	85	2.0	75	2.0	83	2.0	91	2.0	121	2.0	114	2.0	221
Silage	6.4	357	6.5	278	6.4	275	6.5	242	6.4	267	6.5	295	6.5	395	6.5	371	6.4	718
Hay	1.4	80	1.4	61	1.4	61	1.5	55	1.5	61	1.5	67	1.5	89	1.5	85	1.5	163
Cost of 100 lb. gain	$9.89		$8.98		$10.45		$9.81		$11.30		$12.73		$17.26		$16.04		$28.47	
Av. daily gain	1.8		2.3		2.3		2.7		2.4		2.2		1.6		1.7		0.9	
Lot 2																		
Shelled corn	4.0	205	5.3	288	7.3	406	8.3	305	9.0	412	9.4	393	9.7	538	9.3	493	8.1	1360
Molasses	1.5	77	2.0	108	2.0	110	2.0	73	2.0	92	2.0	84	2.0	111	2.0	106	2.0	336
Protein	2.0	102	2.0	108	2.0	110	2.0	73	2.0	92	2.0	84	2.0	111	2.0	106	2.0	336
Silage	6.4	328	6.5	351	6.5	359	6.5	238	6.5	299	6.5	272	6.5	360	6.5	344	6.5	1093
Hay	1.5	75	1.5	81	1.5	83	1.5	55	1.5	69	1.5	63	1.5	83	1.5	79	1.5	252
Cost of 100 lb. gain	$9.11		$11.38		$13.57		$9.62		$12.62		$11.79		$15.91		$14.85		$43.56	
Av. daily gain	1.9		1.8		1.8		2.7		2.2		2.4		1.8		1.9		0.6	
Lot 3																		
Shelled corn	5.0	253	6.5	302	8.1	429	9.4	309	10.4	436	10.4	456	11.4	595	11.6	539	11.4	872
Molasses	1.5	77	2.0	93	2.0	106	2.0	66	2.0	84	2.0	88	2.0	105	2.0	92	2.0	153
Protein	2.0	102	2.0	93	2.0	106	2.0	66	2.0	84	2.0	88	2.0	105	2.0	92	2.0	153
Silage	6.5	329	6.5	299	6.4	340	6.5	213	6.5	271	6.5	284	6.5	339	6.4	298	6.5	498
Hay	1.5	74	1.5	67	1.5	78	1.5	48	1.5	63	1.5	65	1.5	78	1.5	68	1.5	114
Cost of 100 lb. gain	$9.94		$10.70		$13.69		$9.27		$12.57		$13.12		$16.56		$14.83		$24.23	
Av. daily gain	1.9		2.1		1.9		3.0		2.4		2.3		1.9		2.1		1.3	

TABLE 2.—Molasses Feeding Test—Continued

Feed consumption and feed required for gain—by four-week periods

Ration	1st period December		2nd period January		3rd period February		4th period March		5th period April		6th period May		7th period June		8th period July		9th period August	
	Av. daily ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain	Av. ration	Feed for 100 lb. gain
Lot 4	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Shelled corn	5.0	239	6.2	284	7.2	365	8.5	290	9.8	382	10.5	430	11.3	553	11.8	610	11.3	817
Molasses	1.7	80	4.6	212	5.0	257	4.7	161	4.5	178	4.5	182	4.0	193	3.9	200	3.9	221
Protein	2.0	96	2.0	93	2.0	101	2.0	68	2.0	78	2.0	82	2.0	97	2.0	103	2.0	143
Silage	6.5	311	6.4	294	6.4	326	6.5	221	6.5	253	6.5	264	6.5	316	6.5	335	6.5	467
Hay	1.5	70	1.4	64	1.5	75	1.5	51	1.5	58	1.5	60	1.5	73	1.5	77	1.5	108
Cost of 100 lb. gain	$9.53		$12.40		$15.06		$10.71		$13.01		$14.05		$17.06		$18.44		$25.71	
Av. daily gain	2.1		2.2		2.0		2.9		2.5		2.4		2.0		1.9		1.4	
Lot 5																		
Shelled corn	5.0	241	6.5	276	8.1	386	9.4	316	10.4	456	10.4	429	11.4	591	11.7	563	11.3	1108
Molasses	1.5	73	2.0	85	2.0	95	2.0	67	2.0	87	2.0	82	2.0	104	2.0	96	2.0	194
Protein	2.0	97	2.0	85	2.0	95	2.0	67	2.0	87	2.0	82	2.0	104	2.0	96	2.0	194
Silage	6.5	314	6.5	275	6.5	307	6.5	219	6.5	284	6.5	268	6.5	337	6.5	312	6.5	632
Hay	1.4	70	1.5	62	1.5	71	1.5	50	1.5	65	1.5	61	1.5	78	1.5	72	1.5	145
Cost of 100 lb. gain	$9.48		$9.80		$12.33		$9.49		$13.13		$12.31		$16.42		$15.48		$30.57	
Av. daily gain	2.0		2.4		2.0		3.0		2.3		2.4		1.9		2.1		1.0	

TABLE 3.—Molasses Feeding Test

Average daily gains (pounds)—by weeks, and cumulative for week shown on the left

Date	Weeks	Lot 1			Lot 2			Lot 3			Lot 4			Lot 5			All lots	
		Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain to date
Dec. 10	0	370.0	.....	.....	370.25	.....	.....	371.2	.....	.....	373.5	.....	.....	374.15	.....	.....	371.8	.....
Dec. 17	1	382.0	1.71	1.71	385.3	2.16	2.16	383.1	1.70	1.70	390.0	2.36	2.36	389.8	2.23	2.23	386.0	2.03
Dec. 24	2	395.7	1.96	1.83	396.8	1.63	1.89	400.1	2.43	2.06	402.8	1.82	2.09	404.8	2.14	2.18	400.0	2.01
Dec. 31	3	405.8	1.43	1.70	408.4	1.66	1.82	415.2	2.15	2.09	416.8	2.00	2.06	418.3	1.94	2.10	412.9	1.95
Jan. 7	4	420.4	2.09	1.80	425.2	2.41	1.96	426.3	1.59	1.96	431.8	2.15	2.08	431.9	1.93	2.06	427.1	1.97
Jan. 14	5	435.9	2.22	1.88	436.0	1.53	1.88	438.1	1.68	1.91	444.6	1.82	2.03	446.9	2.14	2.08	440.3	1.96
Jan. 21	6	451.2	2.19	1.93	446.0	1.43	1.80	455.8	2.52	2.01	463.0	2.63	2.13	463.8	2.41	2.13	456.0	2.00
Jan. 28	7	475.8	2.78	2.05	461.0	2.14	1.85	467.9	1.74	1.97	474.0	1.57	2.05	478.5	2.11	2.13	470.4	2.01
Feb. 4	8	485.8	2.15	2.07	477.2	2.31	1.91	486.8	2.70	2.06	493.0	2.70	2.13	498.0	2.79	2.21	488.1	2.08
Feb. 11	9	506.2	2.92	2.16	495.2	2.57	1.98	502.9	2.30	2.09	508.2	2.18	2.14	514.1	2.29	2.22	505.3	2.12
Feb. 18	10	523.0	2.39	2.18	508.2	1.86	1.97	515.8	1.83	2.07	526.7	2.63	2.19	532.2	2.59	2.26	521.2	2.13
Feb. 25	11	537.2	2.03	2.17	520.2	1.72	1.95	525.7	1.41	2.00	532.0	0.76	2.06	544.2	1.71	2.21	531.9	2.08
Mar. 4	12	551.3	2.01	2.16	527.8	1.09	1.88	539.7	2.00	2.00	548.2	2.30	2.08	557.0	1.83	2.18	544.8	2.06
Mar. 11	13	573.2	3.13	2.23	550.4	3.23	1.98	558.5	2.68	2.06	571.9	3.39	2.18	584.8	3.96	2.31	567.8	2.15
Mar. 18	14	586.5	1.88	2.21	561.8	1.81	1.97	574.4	2.27	2.07	585.8	1.99	2.17	591.2	1.63	2.26	581.8	2.14
Mar. 25	15	608.2	3.11	2.27	584.6	3.25	2.05	594.1	2.81	2.12	608.5	3.24	2.24	613.6	2.49	2.28	602.0	2.19
Apr. 1	16	626.1	2.55	2.29	602.7	2.59	2.08	624.6	4.36	2.26	630.2	3.10	2.29	640.1	3.78	2.37	625.0	2.26

TABLE 3.—Molasses Feeding Test—Continued

Average daily gains (pounds)—by weeks, and cumulative for week shown on the left

Date	Weeks	Lot 1			Lot 2			Lot 3			Lot 4			Lot 5			All lots	
		Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain for week	Av. gain to date	Av. weight	Av. gain to date
Apr. 8	17	640.2	2.02	2.27	616.1	1.92	2.07	633.0	1.21	2.20	648.6	2.62	2.31	675.0	2.41	2.37	639.2	2.25
Apr. 15	18	657.5	2.46	2.28	628.0	1.71	2.05	649.4	2.33	2.21	661.2	1.80	2.28	669.0	1.71	2.34	653.3	2.23
Apr. 22	19	678.2	2.95	2.31	643.6	2.22	2.06	666.9	2.50	2.22	675.8	2.09	2.27	681.5	2.50	2.35	670.5	2.24
Apr. 29	20	693.8	2.23	2.31	661.3	2.90	2.10	691.2	3.47	2.29	702.0	3.73	2.35	704.0	2.51	2.36	691.1	2.28
May 6	21	714.1	2.91	2.34	675.7	2.05	2.10	699.3	1.15	2.23	718.9	2.41	2.35	715.8	1.69	2.32	705.4	2.27
May 13	22	725.1	1.58	2.31	691.4	2.24	2.10	707.2	1.14	2.18	735.2	2.32	2.35	724.0	1.16	2.27	717.3	2.24
May 20	23	741.4	2.32	2.30	705.5	2.02	2.10	728.9	3.09	2.22	754.5	2.76	2.37	753.0	4.14	2.35	737.2	2.27
May 27	24	755.2	1.97	2.29	728.2	3.23	2.13	755.1	3.74	2.28	770.8	2.32	2.36	772.0	2.71	2.37	756.8	2.29
June 3	25	769.8	2.08	2.28	733.1	0.70	2.09	762.2	1.02	2.23	784.0	1.39	2.34	789.4	2.49	2.37	768.4	2.27
June 10	26	777.3	1.08	2.24	752.3	2.75	2.11	779.4	2.44	2.24	798.5	2.07	2.33	794.3	0.69	2.31	781.0	2.25
June 17	27	790.2	1.84	2.22	764.0	1.67	2.10	797.0	2.52	2.25	813.3	2.11	2.33	816.8	3.21	2.34	796.9	2.25
June 24	28	800.9	1.53	2.20	778.7	2.10	2.10	808.5	1.64	2.23	828.2	2.12	2.32	825.8	1.29	2.30	809.0	2.24
July 1	29	813.0	1.72	2.18	785.2	0.94	2.06	819.2	1.53	2.21	842.0	1.98	2.31	846.2	2.91	2.32	822.0	2.22
July 8	30	827.1	2.01	2.17	802.2	2.41	2.07	840.6	3.05	2.23	857.0	2.14	2.30	857.5	1.61	2.30	837.6	2.22
July 15	31	831.2	0.59	2.11	812.3	1.44	2.05	846.7	0.86	2.17	867.2	1.45	2.27	865.5	1.15	2.24	845.2	2.18
July 22	32	849.7	2.63	2.14	831.7	2.76	2.07	869.0	3.19	2.22	882.2	2.14	2.27	884.0	2.64	2.28	864.0	2.20
July 29	33	853.6	0.56	2.09	833.2	0.21	2.02	870.5	0.21	2.16	890.9	1.24	2.24	886.3	0.31	2.22	867.6	2.15
Aug. 5	34	862.5	1.27	2.07	840.0	0.98	1.99	888.0	2.50	2.17	898.8	1.12	2.21	895.4	1.31	2.19	877.7	2.13
Aug. 12	35	856.8	0.82	1.99	834.0	0.86	1.91	881.8	0.89	2.08	903.3	0.65	2.16	893.5	0.27	2.12	874.7	2.05
Aug. 19	36	874.8	2.58	2.00	861.0	2.08	1.92	905.5	3.39	2.12	921.0	2.53	2.17	912.7	2.75	2.14	896.0	2.07

It is usually considered that cattle that make the most rapid gains are the fattest. This was not the case in this test. During the sixth week of the test it seemed that the Lot 1 calves were showing more thickness of flesh than the calves in Lots 3, 4, or 5, in spite of the fact that they had not gained as many pounds. From this time on the degree of finish became more pronounced in favor of Lot 1, until near the close of the test the spread narrowed. At the close of the test most observers felt that Lot 1 was the fattest of the five lots of cattle. Lot 4 was a close second, and a few competent judges of cattle felt they were fully as fat. Lot 4 gained 43 pounds more per calf than Lot 1 during the test and did not look as though they had been calves of similar size when the test started. If calves fed no molasses were fattening more rapidly than the molasses-fed calves, in spite of less gains, it is probable that the molasses-fed calves were putting more of their gain into growth.

Dr. C. H. Hunt, of the Nutrition Division of this department, started feeding rats on January 27 to obtain further information on this point. The rats duplicated the performance of the calves. Other rats were then fed so as to obtain still more information, with results leading to the conclusion that molasses—both cane and beet—contained a growth factor. It is believed that the results obtained are due to factors other than protein. The calves fed beet molasses, Lot 5, outgained the calves fed cane molasses, Lot 3, during the early part of the test, but lost some of this advantage during the latter part of the feeding period. In feeding beet and cane molasses to rats, Dr. Hunt reports that the beet-molasses-fed rats have outgained the cane-molasses-fed rats during the first half of the feeding test, while the reverse has been true during the latter half of the test. More work is in progress relative to this point, and results will be available at a future date.

Table 4 shows in greater detail the performance of the calves in Lots 1 and 3. The table shows relatively greater gains in the case of the light calves, when molasses was a part of their ration. It also shows that both the heavy and light calves of Lot 3 outgained the Lot 1 calves during the last four months of the feeding period. The heavy calves in Lot 1 made more rapid gains during the first five months but failed to hold this advantage during the last four months. The light calves of Lot 1 also showed a more marked falling off in gains as the test progressed than did the light calves in Lot 3. Lot 1, at the close of the test, had the appearance of being of a smaller, earlier-maturing type than either of the other

TABLE 4.—Molasses Feeding Test

Gains of heavy and light calves (pounds), shown for first five months and last four months of experiment

		Lot 1 First five months				Lot 1 Last four months			Lot 1 Full 9 months			Lot 3 First five months					Lot 3 Last four months			Lot 3 Full 9 months	
	Steer No.	Initial weight	Final weight	Total gain	Av. daily gain	Final weight	Total gain	Av. daily gain	Total gain	Av. daily gain	Steer No.	Initial weight	Final weight	Total gain	Av. daily gain	Final weight	Total gain	Av. daily gain	Total gain	Av. daily gain
Ten heavy Calves	420	462	850	388	2.77	1085	235	2.10	623	2.47	376	482	880	398	2.84	1105	225	2.00	623	2.47
	326	460	873	413	2.95	1055	182	1.62	595	2.36	378	455	835	380	2.71	1080	245	2.19	625	2.48
	387	437	853	416	2.97	1070	217	1.93	633	2.51	58	440	802	362	2.58	1042	240	2.14	602	2.39
	294	415	730	315	2.25	903	173	1.54	488	1.94	12	420	727	307	2.19	950	223	1.99	530	2.10
	276	405	720	315	2.25	857	137	1.22	452	1.79	398	420	780	360	2.57	893	113	1.01	473	1.88
	338	390	712	322	2.30	837	125	1.12	447	1.77	407	415	668	253	1.81	872	204	1.82	457	1.81
	264	387	705	318	2.27	903	198	1.77	516	2.05	1	400	750	350	2.50	975	225	2.00	575	2.28
	101	380	725	345	2.46	957	232	2.07	577	2.29	394	385	635	250	1.79	780	145	1.29	395	**1.57**
	349	380	678	298	2.13	880	202	1.80	500	1.98	350	375	670	295	2.11	983	313	2.79	608	**2.41**
	396	380	715	335	2.39	890	175	1.56	510	2.02	227	375	695	320	2.28	940	245	2.19	565	**2.24**
		.....	.....	3,465	2.47	.....	1,876	1.67	5,341	2.12		.....	.....	3,275	2.34	.....	2,178	1.94	5,453	2.16
Ten Light Calves	353	375	760	385	2.75	950	190	1.69	575	2.28	365	375	707	332	2.37	913	206	1.84	538	2.13
	11	358	670	312	2.23	830	160	1.43	472	1.87	348	350	735	385	2.75	960	225	2.00	610	2.42
	355	345	595	250	1.78	725	130	1.16	380	1.51	354	340	622	282	2.01	855	233	2.08	515	2.04
	13	340	580	240	1.71	770	190	1.69	430	1.71	363	335	642	307	2.19	835	193	1.72	500	1.98
	370	317	665	348	2.48	800	135	1.20	483	1.92	4	330	675	345	2.46	940	265	2.36	610	2.42
	331	315	607	292	2.08	785	178	1.59	470	1.86	298	320	625	305	2.18	860	235	2.10	540	2.14
	373	315	643	328	2.34	810	167	1.49	495	1.95	377	320	562	242	1.73	738	176	1.57	418	1.66
	423	315	637	322	2.30	845	208	1.85	530	2.10	310	317	600	283	2.02	790	190	1.70	473	1.87
	20	310	580	270	1.93	773	193	1.72	463	1.83	19	312	620	308	2.20	840	220	1.96	528	2.09
	337	290	577	287	2.05	738	161	1.44	448	1.78	409	302	595	293	2.10	802	207	1.85	500	1.98
		.....	.....	3,034	2.17	.....	1,712	1.53	4,746	1.88		.....	.....	3,082	2.20	.....	2,150	1.92	5,232	2.08

lots. Several observers mentioned this point after seeing the various lots without knowing how they had been fed. It is believed that the ration was responsible for this difference.

Table 5 shows the feed and water consumption from April 8 to August 19. The meters were not installed until danger of freezing was past. The Water Works Department of Wooster checked the meters and found that they were registering accurately. No meter was placed on the water supply of Lot 5. The daily ration for the period shows that Lot 2 received slightly more feed than did Lot 1. This was due to the fact that there was no refuse feed from Lot 2.

TABLE 5.—Molasses Feeding Test

Gains, ration, and water consumption—April 8 to August 19

	Lot 1	Lot 2	Lot 3	Lot 4
Number steers on test	20	19	20	20
Av. weight per steer (lb.)	640	616	633	648
Av. gain per steer (lb.)	235	255	272	273
Av. daily ration: (lb.)				
Shelled corn	10.85	8.93	10.94	10.90
Molasses		2.00	2.00	3.97
Protein	1.99	2.00	1.99	1.99
Silage	6.45	6.5	6.46	6.48
Mixed hay	1.47	1.5	1.49	1.49
Av. water consumption (gal.)	5.54	5.59	6.74	6.49

The water consumption of the first two lots does not indicate that the use of two pounds of molasses in place of two pounds of corn increases water consumption. It should be remembered that Lot 2 was limited in feed consumption. Lots 3 and 4 consumed slightly more corn, in addition to the molasses.The water consumption of Lots 3 and 4 was noticeably greater than that of the first two lots, due, probably, to greater feed consumption. Lot 4 consumed less water than Lot 3, in spite of their increased molasses consumption. Molasses increased feed consumption, and the increased feed consumption was doubtless mainly responsible for the increased consumption of water.

Table 6 shows a summary of the gains, ration, feed requirements, and cost of gains for the entire test. The valuation of the feeds used is always a debatable point. Cost of gains, using different valuations on corn, is shown. It is realized that variations exist in the value of the other feeds. It is suggested that interested parties use the feed requirements shown and feed values applicable to their own situation.

TABLE 6.—Molasses Feeding Test

Gains, ration, feed requirement, and cost of gains for the thirty-six weeks of test

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Steer calves per lot	20	20*	20	20	20
Weight December 10.....(lb.).	370	370	371	373	374
Weight August 19.....(lb.).	874	861	905	921	913
Av. daily gain.....(lb.).	2.00	1.92	2.12	2.17	2.14
Av. daily ration:					
Shelled corn.....(lb.).	9.7	7.8	9.4	9.0	9.4
Molasses.....(lb.).	.....	1.9	1.9	4.0	1.9
Protein supplement.....(lb.).	2.00	2.00	2.00	2.00	2.00
Silage.....(lb.).	6.5	6.5	6.5	6.5	6.5
Hay.....(lb.).	1.5	1.5	1.5	1.5	1.5
Salt.....(oz.).	0.47	0.52	0.34	0.34	0.37
Feed per 100 lb. gain:					
Corn.....(lb.).	484	404	441	418	438
Molasses.....(lb.).	.....	101	92	184	91
Protein supplement.....(lb.).	100	104	94	92	93
Silage.....(lb.).	322	338	305	298	304
Hay.....(lb.).	73	78	70	68	70
Salt.....(oz.).	18.5	27.2	15.8	15.5	17.4
Cost per cwt. gain (98c corn)	$12.55	$13.14	$13.19	$14.31	$13.10
Cost per cwt. gain (90c corn)	11.86	12.56	12.56	13.71	12.47
Cost per cwt. gain (80c corn)	11.00	11.85	11.78	12.97	11.70
Cost per cwt. gain (70c corn)	10.14	11.12	10.99	12.22	10.91

Protein supplement was equal parts linseed meal and cottonseed meal.

Linseed meal $58.; cottonseed meal $46.; silage $6.50; hay $12.; molasses $35.; salt $20. per ton; hogs $9. net per cwt.

*Steer died March 9. One steer slaughtered April 22 and another August 16—each with urethra closed at neck of bladder.

Three steers were lost from the test, as shown in the notation. The steer that died March 9 was apparently hurt, but post-mortem examination did not clearly establish this point. The other two steers suffered from urethras closed at the neck of the bladder. Whether molasses was in any way responsible for this situation is not known.

Table 7 shows the financial outcome of the various lots. The test closed August 19 when the cattle were taken to the Ohio State Fair and exhibited in their respective lots. On Tuesday, August 26, representatives of the Producers' Cooperative Commission Association, from the markets mentioned, valued the various lots on the basis of sales made at their respective markets on August 25. At this time the markets were on a basis when weight was not a factor in determining values. The valuations, as placed by the market representatives, therefore, refer to the condition of the cattle. These valuations were averaged, discounted 80 cents per hundred weight for marketing, and the loss per steer shown on that basis, without the pork credit.

The cattle were sold on August 27 in the auction for carlots at the State Fair. A rapidly rising cattle market during the week materially helped in reducing the loss per steer.

The pork credit per lot indicates a slight advantage in the molasses-fed lots, when the total amount of corn fed is considered. Lot 2 shows a smaller amount of pork credit, because of the reduction in corn due to loss of steers and limited ration. Molasses in the ration of the steer may have a slight effect on the pigs following the steers.

TABLE 7.—Molasses Feeding Test

Financial summary

December 10 to August 19 (252 days)	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Number of calves per lot	20	20*	20	20	20
Weight, December 10 (lb.)	370	370.2	371.2	373.5	374
Cost per cwt.	$14	$14	$14	$14	$14
Feed lot weight, August 19 (lb.)	875	861	905	921	913
Market appraisals (as of August 25):					
Buffalo	$12.00	$11.50	$11.85	$12.00	$11.85
Chicago	11.90	11.60	11.80	11.90	11.80
Cincinnati	11.50	11.00	11.25	11.25	10.75
Cleveland	11.75	11.25	11.65	11.75	11.60
Pittsburgh	11.50	10.75	11.00	11.25	11.00
Average of markets (less 80c. market charge)	10.93	10.42	10.71	10.83	10.60
Loss per head (without pork credit)	$19.57	$26.43	$25.47	$30.88	$25.90
Pork credit per lot (lb.)	944	808	978	1053	1015
Returns per bu. corn (pork credited)	$ .63	$ .33	$ .48	$ .34	$ .47
Actual selling price (cwt.), State Fair Auction	$12.75	$12.25	$12.20	$12.75	$12.50
Actual selling weights (lb.)	840	826.5	861	875.5	869
Loss per head (without pork)	$ 8.09	$14.19	$17.41	$19.00	$14.30
Loss per head (with pork credit)	3.84	10.98	13.00	14.26	9.70
Returns per bu. corn (pork credited)	.89	.65	.67	.63	.75

Feed prices used: Shelled corn 98¢ bu.; linseed meal $58.; cottonseed meal $46.; silage $6.50; mixed hay $12.; salt $20.; molasses $1.75 per cwt.
Pork gains credited at $9. net per cwt.

The molasses-fed cattle were slightly "looser" than the Lot 1 cattle. Lot 4, self-fed molasses, was "looser" than either of Lots 2, 3, or 5, though they were not sufficiently "loose" to be subject to criticism. In our experience, beet molasses was not noticeably different from cane molasses in this respect.

We believe that the valuations placed on the cattle by the market appraisers are preferable to the auction sale price as guides to the relative merits of the various lots.

The returns per bushel of corn show clearly that the addition of molasses to the ration was not economical in this test.

Molasses did not substitute for corn in Lot 2. Self-feeding molasses produced the most rapid gains, and one of the best selling lots of cattle, but it cost too much to produce the gains. What different amounts of molasses, a longer feeding period, or different weight cattle might give in the way of results is not known.

CONCLUSIONS

1. Two pounds of cane feeding molasses did not replace two pounds of shelled corn in a thirty-six-week fattening test with calves.

2. Two pounds of either cane or beet feeding molasses noticeably increased feed consumption.

3. Self-feeding cane molasses produced rapid gains and a high selling value, but was uneconomical because of too costly gains.

4. Beet molasses, when fed at the rate of two pounds daily per calf, was fully the equal of cane molasses, when fed at the same rate.

5. Both cane and beet molasses contain a growth factor. This growth factor probably has an important place in calf fattening rations when a long feeding period is followed; otherwise, it is probably a handicap.

6. Calves fed beet molasses as a part of their ration made more efficient gains during the early part of a nine-month feeding period, and less efficient gains during the latter part of the test, than did calves fed cane molasses.

7. Molasses did not appreciably increase water consumption, when used as a substitute for shelled corn in a limited ration. When molasses was used in a ration where corn was full-fed, molasses increased feed consumption, which, in turn, increased water consumption.

8. Self-feeding molasses did not cause the cattle to scour.

9. Cost of producing gains is a more important factor in profitable cattle feeding than either rapidity of gains or market topping ability.

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